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ABSTRACT

Ausubel distinguishes two kinds of human learning: (1) rote learning, relevant only to a small fraction of human learning, is the mechanistic formation of discrete, isolated traces in cognitive structure, usually through a process of conditioning; (2) meaningful learning, characteristic of most human learning, is a process of "subsuming" material into an established conceptual hierarchy by means of such capacities as symbolic representation, abstraction, categorization, and generalization. Rote learning can be effective on a short-term basis, but for any long term retention, it fails because of the tremendous buildup of interference. The theory of subsumption infers the operation of certain "cognitive pruning" procedures in meaningful learning by means of which a person systematically "forgets" certain cognitive material in order to enhance learning. This perspective provides a strong theoretical basis for the rejection of rote learning processes and suggests, accordingly, a restructuring of theories in second language acquisition. (Author/VM)

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ABSTRACT

COGNITIVE PRUNING AND SECOND LANGUAGE ACQUISITION

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Ausubel's theory of subsumption infers the operation of certain "cognitive pruning" procedures in meaningful learning by means of which a person systematically "forgets" certain cognitive material in order to enhance learning. This perspective provides a strong theoretical basis for the rejection of rote learning processes upon which some currently popular language-teaching methods rely, and suggests, accordingly, a restructuring of our conception of the process of second-language acquisition.

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COGNITIVE PRUNING AND SECOND LANGUAGE ACQUISITION*

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Language teachers today find themselves in a curious predicament. A few years ago it appeared that the dilemma of language-teaching methodology had been resolved by the adoption of a so-called "scientific method". Then transformational-generative linguistics began to seriously question widely-acclaimed conditioning approaches to language learning; however, this new orientation provided no new truth for second-language teaching to replace the old paradigm. Now, with the slow realization that the theoretical rug has been effectively pulled out from under our feet, we are left with neither theory nor method, and only a few "insights" (Krohn, 1970) into language.

In the face of the "irrelevance" (Lamendella, 1969) of much of current linguistic theory, some glimmer of hope is apparent in recent attempts in language teaching to stress the importance of meaning over structure, semantics over syntax, and situational context over mechanistic pattern repetition (Newmark and Reibel, 1968; Hauptman, 1970; Nilsen, 1971). While the importance of meaningful contexts in language learning has long been recognized, recent formulations are a direct reaction to highly structured syntactic approaches which have been found to be inadequate in many ways.

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Using Kuhn's (1962) model of the structure of scientific revolutions, we could quite plausibly claim that this state of affairs is characteristic of an "interparadigmatic" stage in second-language acquisition theory. We are now proceeding out of an anomalous stage and are on the verge of the formation of a new paradigm which will center on the primacy of semantic and cognitive functioning. Positive guidance for such a paradigm is available from theories of generative semantics in linguistics and from cognitive theories of learning in psychology. Unlike transformational-generative models of the 1960's, however, the new paradigm is highly relevant to language acquisition and language-teaching methodology.

The purpose of this paper is to suggest some major psychological principles underlying this trend toward a new paradigm. While my statements may be directly relatable to the so called "situational approach", it is not my intention to defend particular aspects of that approach, as do Hauptman (1970), Nilsen (1971), and others. Instead, I hope to outline a cognitive model of learning on the basis of which, or, at least in reference to which, proposals could be made for second-language-teaching methodology and eventually a substantial theory of second-language acquisition.

This cognitive model is based on David Ausubel's theory of "subsumption" in human learning. It is within this framework that what I have chosen to call "cognitive pruning" procedures may become an important aspect of second-language acquisition.

An overview of my argument can be given in six steps: (i) rote learning is a mechanistic process peculiar to only a small fraction of human learning; (ii) meaningful learning, an efficient conceptualizing process of organization, is characteristic of most human learning; (iii) retention,

or long term memory, is the crucial determiner of whether or not something is indeed learned; (iv) retention of rotely learned material is extremely inefficient since forgetting is easily induced by interference; (v) retention of meaningfully learned materials is, in contrast, extremely efficient since forgetting involves a selective "cognitive pruning" procedure arising out of a need for cognitive economy, a procedure which actually enhances retention; (vi) in an activity like second-language learning, which is conducive to meaningful learning processes, maximal retention could be achieved by means of efficient subsumption and pruning procedures.

Now let me amplify this argument.

In the perspective of meaningful learning the concept of rote learning takes on new significance. Ausubel describes rote learning as the process of acquiring material as "discrete and relatively isolated entities that are relatable to cognitive structure only in an arbitrary and verbatim fashion, not permitting the establishment of ['meaningful'] relationships" (Ausubel, 1968:108). That is, rote learning involves the mental storage of items having little or no association with existing cognitive structure. Most of us, for example, can rotely learn a few necessary phone numbers and zip codes, without reference to cognitive hierarchical organization.

Meaningful learning, on the other hand, may be described as a process of relating and anchoring new material to relevant established entities in cognitive structure. As new material enters the cognitive field, it interacts with, and is appropriately "subsumed" under, a more inclusive conceptual system. The very fact that material is subsumable, that is, relatable to stable elements in cognitive structure, accounts for its meaningfulness. If we can conceive of cognitive structure as a system of building blocks, then rote learning is the process of

acquiring isolated blocks with no particular function in the building of a structure, and therefore with no relationship to other blocks; meaningful learning is the process whereby blocks become an integral part of already established categories or systematic clusters of blocks. This conception is not unlike the process of nucleation in physics, used in an analogy to language learning by Pike (1960). Any learning situation can be meaningful if (a) the learner has a meaningful learning set, that is, a disposition to relate the new learning task to what he already knows, and (b) the learning task itself is potentially meaningful to the learner, that is, relatable to the learner's structure of knowledge.

The distinction between rote and meaningful learning may not appear to be important since in either case material can be acquired or learned. But the significance of the distinction becomes clear when we consider the relative efficiency of the two kinds of learning in terms of retention, or, long term memory. We are often tempted to examine learning from the perspective of acquisition alone, failing to consider the uselessness of a learned item which is not retained. Humans are capable of learning almost any given item within the so called "magic seven, plus or minus two" (Miller, 1956), for perhaps a few seconds, but long term memory is a different problem. We can remember an unfamiliar phone number, for example, long enough to dial the number, after which point it is usually extinguished by interfering factors and forgotten. But a meaningfully learned, subsumed item has far greater potential for retention. If you were asked to recall all your previous phone numbers (assuming you have moved several times in your life) it is doubtful you would be very successful; a phone number is quite arbitrary, bearing little meaningful relationship to reality

(other than perhaps area codes and other such systematization). But previous street addresses, for example, can be more efficiently retained, since they bear some meaningful relationship to the reality of physical images, directions, streets, houses, and the rest of the town, and are therefore more suitable for long term retention without concerted reinforcement.

Ausubel provides a plausible explanation for this apparently universal nature of forgetting. Since rotely learned materials do not interact with cognitive structure in a substantive fashion, they are learned in conformity with the laws of association, and their retention is influenced primarily by the interfering effects of similar rote materials learned immediately before or after the learning task (commonly referred to as proactive and retroactive inhibition). In the case of meaningfully learned material, retention is influenced primarily by the properties of "relevant and cumulatively established ideational systems in cognitive structure with which the learning task interacts." (Ausubel, 1968: 108) Compared to this kind of extended interaction, concurrent interfering effects have relatively little influence on meaningful learning, and retention is highly efficient. Hence, addresses are retained as part of a meaningful set, while phone numbers, as self-contained, isolated entities, are easily forgotten.

We cannot say, of course, that meaningfully learned material is never forgotten! However, in the case of such learning, forgetting takes place in a much more intentional and purposeful manner because it is a continuation of the very process of subsumption by which one learns; forgetting

is merely a second or, "obliterative" stage of subsumption, characterized as "memorial reduction to the least common denominator" (Ausubel, 1963a: 218). Because it is more economical and less burdensome to retain a single inclusive concept than to remember a large number of more specific items, the importance of a specific item tends to be incorporated into the generalized meaning of the larger item. In this obliterative stage of subsumption the specific items become progressively less identifiable as entities in their own right until they are finally no longer available and are said to be forgotten. It is this second stage of subsumption that operates through what I am calling "cognitive pruning" procedures. Pruning is the elimination of unnecessary clutter and a clearing of the way for more material to enter the cognitive field, in the same way that pruning a tree ultimately allows greater and fuller growth. Using the building-block analogy, you might say that, at the outset, a structure made of blocks is seen as a few individual blocks, but as "nucleation" begins to give the structure a perceived shape, some of the single blocks achieve less and less identity in their own right, and become subsumed into the larger structure. Finally the single blocks are lost to perception, or "pruned" out, to use the metaphor, and the total structure is perceived as a single whole without clearly defined parts.

An important aspect of the pruning stage of learning is that subsumptive forgetting, or pruning, is not haphazard or chance—it is systematic. Thus by promoting optimal pruning procedures, we have a potential learning situation which will produce retention far beyond that normally expected under more traditional theories of forgetting.

Turning more specifically to instances of second-language acquisition, we can draw three important implications from Ausubel's theory of subsumption.

I

The existence of a hierarchy in cognitive organization implies the possibility of organizing language curricula according to such a hierarchy. While we should heed Jakobovits' (1970) warning against the temptation to take any theory "literally", as too many language teachers do, we could nevertheless provide current cognitively-oriented approaches with an explanatory basis for sound situational sequencing, something often relegated to whim or individual teacher intuitions at most.

Kennedy (1970) proposed a cognitive-category approach to the study of first-language acquisition which, he argues, is a superior indicator of linguistic competence in children learning their first language. This kind of approach certainly has positive applications to the study of second-language acquisition.

A great deal of detailed research remains, of course, in specifying the cognitive hierarchy—preferably a universal cognitive hierarchy—upon which to build second-language materials and programs. This kind of inquiry, however incomplete at present, is necessary in order to give situational approaches a cutting edge, so that items in a curriculum move from meaningful set to meaningful set, thereby promoting subsumption and pruning. It is entirely possible that current syntactically structured approaches only give rise to cognitive clutter which, for lack of subsumptive power, fosters rote learning processes and thus easy forgetting.

One of the most important aspects of this suggestion is that contrastive analysis, as it is conceived on the basis of interference, would become almost completely irrelevant. Even Wardhaugh's (1970) "weak" position would become unnecessary for meaningfully learned material since interference is a negligible factor in the pruning process. Some form of contrastive analysis might become viable on the level of cognitive universals. For example, Ritchie's (1967) suggestion for contrasting deep structures might be adapted to a semantic/cognitive level.

II

Subsumption theory provides a strong theoretical basis for the rejection of conditioning models of practice and repetition in language teaching. In a meaningful process like second-language learning, mindless repetition, imitation, and other rotely oriented practices in the language classroom have no place. The audiolingual method, which has emerged as the most widely used and accepted method of foreign language teaching today, is based almost exclusively on a behavioristic theory of conditioning which relies heavily on rote learning. The mechanical "stamping in" of the language through saturation with little reference to meaning is seriously challenged not just by subsumption theory but also by numerous proposals for "cognitive-code-learning" methods. Rote learning can be effective on a short term basis, but for any long term retention it fails because of the tremendous build-up of interference. In those cases where efficient long term retention is attained in rote learning situations like those often found in the audiolingual method, it would appear that by sheer dogged determination, the learner has somehow subsumed the material meaningfully in spite of the method.

III

Cognitive pruning is an important consideration in the automatizing stage of language learning. In the early stages of language learning, certain devices (definitions, paradigms, illustrations, or rules) are often used to facilitate subsumption. We can regard these devices as initially meaningful. But in the process of making language automatic, the devices can serve as <u>interim</u> entities, meaningful at a low level of subsumption, and then be systematically pruned out at later stages of language learning. We can thus better achieve the goal of communicative competence by removing unnecessary barriers to automaticity. A definition or a paraphrase, for example, might be initially facilitative, but as its need is minimized by larger and more global conceptualizations, it is pruned.

While we are all fully aware of the decreasing dependence upon such devices in language learning, subsumption theory may help to give explanatory adequacy to the notion. As language teachers, we should be prepared to urge students to <u>forget</u> these interim, less dissociable items as they make progress in a language. This consideration reflects on testing techniques which ask for something other than the communicative <u>use</u> (comprehension or production) of language. Linguistically minded teachers can be <u>too</u> conscious of elements which may be interesting for the linguist, but which only hinder language acquisition by stifling the pruning process.

While Ausubel's conception of meaningful learning provides valuable insights, it also presents a number of problems. First, we do not know, especially at early "nucleation" stages, exactly how subsumption occurs in human learning in general, much less in second-language acquisition in

particular. No model has been proposed, for example, to account for the relationship between linguistic competence and what McNeill (1971) recently called "stable cognitive states". Second, while meaningful learning of all kinds is certainly facilitated linguistically, it is not clear whether language acquisition should be explained in terms of the acquisition of added subsumers, the reshaping of existing subsumers, or perhaps some other cognitive change. Third, the "meaningfulness" of hypothetical grammatical rules is yet to be determined; we can only assume, along with generative semanticists, that semantic processes out of which grammatical rules may emerge are of prime importance in that they clearly relate to cognitive functioning.

Despite these questions and problems, there is a good deal of promise for second-language teaching in cognitively-oriented models of language, a promise which early transformational-generative theory was never able to offer. With further research and more formalized and explicit statements on the nature of subsumers, meaningful sets, and pruning procedures, a viable theory of second language acquisition could well be in the making.

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